

Remarks/Arguments

Attorney for Applicant submits this Letter of Response to further support the distinction of the present invention from the prior art of record and to place the present application in condition for allowance. Such action is respectfully solicited.

Claims 71 to 168 remain in the present application.

The Summary of the Office Action dated October 20, 2006 erroneously indicates that Claims 1 to 168 are pending in the application. Applicant has previously cancelled Claims 1 to 70 of the application, as filed and, therefore, point out that the presently pending claims are Claims 71 to 168.

The Examiner has noted typographical errors in Claims 72, 73, 74, 113, 134, 135, and 136. Applicant has made appropriate corrections to overcome the noted typographical errors and to place the application in form for allowance.

The claims of the present application are directed to a high activity catalyst unexpectedly formed in a specific manner from specifically defined components. The claims are formatted as follows:

- Claims 71 to 132 are product-by process claims wherein the catalyst composition is “formed by contacting substantially simultaneously in a single reaction zone and in an inert liquid” the specifically defined components a), b) and c). The exact nature of the catalyst composition, once components a), b) and c) have been contacted together, is not readily identifiable. Therefore, the claims are in product-by-process format to most properly define the invention.
- Claims 133 to 166 are product claims directed to a mixture of specific components a), b) and c), irrespective of how formed. These claims define the initial mixture of a), b) and c) and may also define the resultant catalyst product.
- Claims 162 to 168 are directed to the process of forming the subject catalyst composition.

Applicant has found that by contacting specific ratios of certain defined classes of components in the manner prescribed, a highly active polymerization catalyst can be formed. The catalyst of the present invention has been unexpectedly formed by the direct mixture of i) a small amount of certain defined aluminum compounds that are not an aluminoxane class of compound; with ii) an inorganic oxide, such as silica, having a limited amount of hydroxyl groups present on the surface of the inorganic oxide; and with iii) a non-metallocene, bidentate or tridentate ligand/transition metal complex. The present catalyst is formed by merely contacting substantially simultaneously the three classes of components described above in an inert liquid media.

Applicant acknowledges that the defined aluminum compound has been used as a co-catalyst/activator in other catalyst systems; that generic inorganic oxides, such as silica and alumina materials, have been used as supports in other catalyst systems; and that bi-and/or tri-dentate transition metal complexes have been used as a pre-catalyst in other catalyst systems. However, it is respectfully submitted that such general knowledge by one skilled in this art would not direct one nor suggest the presently claimed invention.

With respect to aluminum compounds as a co-catalyst, the prior art admittedly teaches that Lewis acid compounds are useful as a co-catalyst /activators with respect to bi- and tridentate/transition metal complex pre-catalysts. However, it is well recognized that it is necessary to utilize a strong Lewis acid co-catalyst compound (such as MAO or borane compounds) with such pre-catalysts. The shortcomings of such strong Lewis acid co-catalysts are fully discussed in the Background section of the present application. If a weak Lewis acid activator, such as the presently defined aluminum compound [Component a)], is contemplated for use, the standard practice is to employ large quantities of such weak Lewis acid co-catalyst relative to the transition metal pre-catalyst of the system. The presently claimed invention unexpectedly provides an active catalyst system when using very low molar ratio of the weak Lewis acid aluminum co-catalyst compounds defined by component a) of the claims with respect to transition metal bidentate and/or tridentate pre-catalyst compounds defined by component c) of the claims. This is counter to that of the prior art.

With respect to the inorganic oxide as a support medium, the prior art admittedly teaches the use of oxides, such as silica and alumina, as support material. The Examiner has taken the position that if “the inorganic oxide is the same [general compound], the properties must be the same.” Such is not the case. Applicant submits three (3) learned articles that discuss changes in surface hydroxyl content of silica structures (The material taught suitable by the cited art of record and which is specifically addressed by the Examiner.) that can be achieved.

In The Colloid Chemistry of Silica, Edited by H.E. Bergna, ACS Advanced Chemistry Series 234 (1994), the paper by Unger “Amorphous and Crystalline Porous Silica” states at Page 178 that

“[t]he concentration [of hydroxyl groups] decreases monotonically with increasing temperature when silicas are thermally pretreated under vacuum. Physisorbed water is first removed at temperatures between 380 and 420K. Simultaneously, hydrogen-bonded hydroxyl groups condense to strained siloxane groups, which act as Lewis sites....Strained siloxane groups are formed up to about 770 K and then convert into stable siloxane groups.”

Unger, *supra*, concludes that

“[t]he silica surface represents a dynamic system that undergoes slight to notable changes depending on the conditions of the environment.”

Further, in The Chemistry of Silica: Solubility, Polymerization Colloid and Surface Properties, and Biochemistry, by R.K. Iker, includes, at Pages 624-648, a section entitled “Nature of Silica Surface” directed to the different modifications that such inorganic oxides may have and includes, on Page 635, Figure 6.3, a graphic showing of the reduction in number of hydroxyl groups present on silica surface as treatment temperature is increased.

In Sol-Gel Science: The Physics and Chemistry of Sol-Gel Processing, by C.J. Brinker and G.W. Scherer, Chapt. 10 Section 3, “Dehydroxylation” describes both thermal and chemical means to dehydroxylate the surface of silica and illustrates the structural changes that occur.

The above teachings are similarly applicable to other inorganic oxides.

Thus, it is clear that the Examiner’s contention that when “the inorganic oxide is the same, the properties must be the same” is not correct. Instead, one can modify the inorganic

oxide by thermal or chemical treatment to achieve materials having variations in its properties, such as having the present claims required low range of surface hydroxyl groups.

Applicant has unexpectedly found that one can obtain a high activity catalyst composition by:

- i) contacting the specifically defined components a), b) and c) substantially simultaneously in a single reaction zone and in a liquid medium;
- ii) using the aluminum co-catalyst/activator compounds of Component a) in a low molar ratio with respect to the transition metal of the pre-catalyst Component c); and
- iii). using an inorganic oxide which has a low surface hydroxyl concentration of from 0.01 to 12 mmole/gram.

The above are not taught nor suggested by the teachings of the cited references.

The Examiner has rejected the indicated claims as being fully taught and anticipated under 35 USC 102(e) by Bennett (US 5,955,555) or by Mackenzie et al. (US 6,303,720) or by Panasik et al. (US 6,365,539). It is respectfully submitted that the presently claimed invention is distinct from and not suggested by any one or a combination of the references. Withdrawal of each of the rejections is solicited.

Applicant has previously shown that the combination of the three elements indicated herein above are not taught nor suggested by the cited art. Further, Applicant has provided learned references that support his statement that general teaching of the use of silica or alumina by the prior art does not teach nor suggest the presently claimed Component b) material.

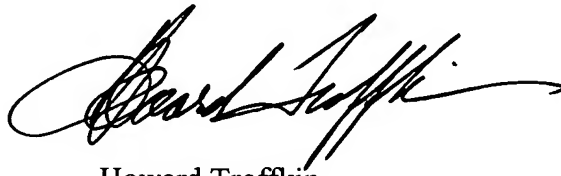
It is well recognized that catalytic chemistry is an unpredictable art. General teachings can not be deemed to specifically direct or make obvious the presently claimed specific amount and type of components and the mode of applying the components to form catalyst composition having high activity capable of forming high molecular weight product.

Withdrawal of each of the rejections made in view of Bennett, Mackenzie et al. and Panasik et al. is respectfully solicited.

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Applicant believes that the Examiner will agree that the presently claimed invention is patentably distinct from the cited art of record and that the application is in condition for allowance. Such action is respectfully solicited.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Howard Troffkin", with a large, sweeping flourish extending to the right.

Howard Troffkin

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